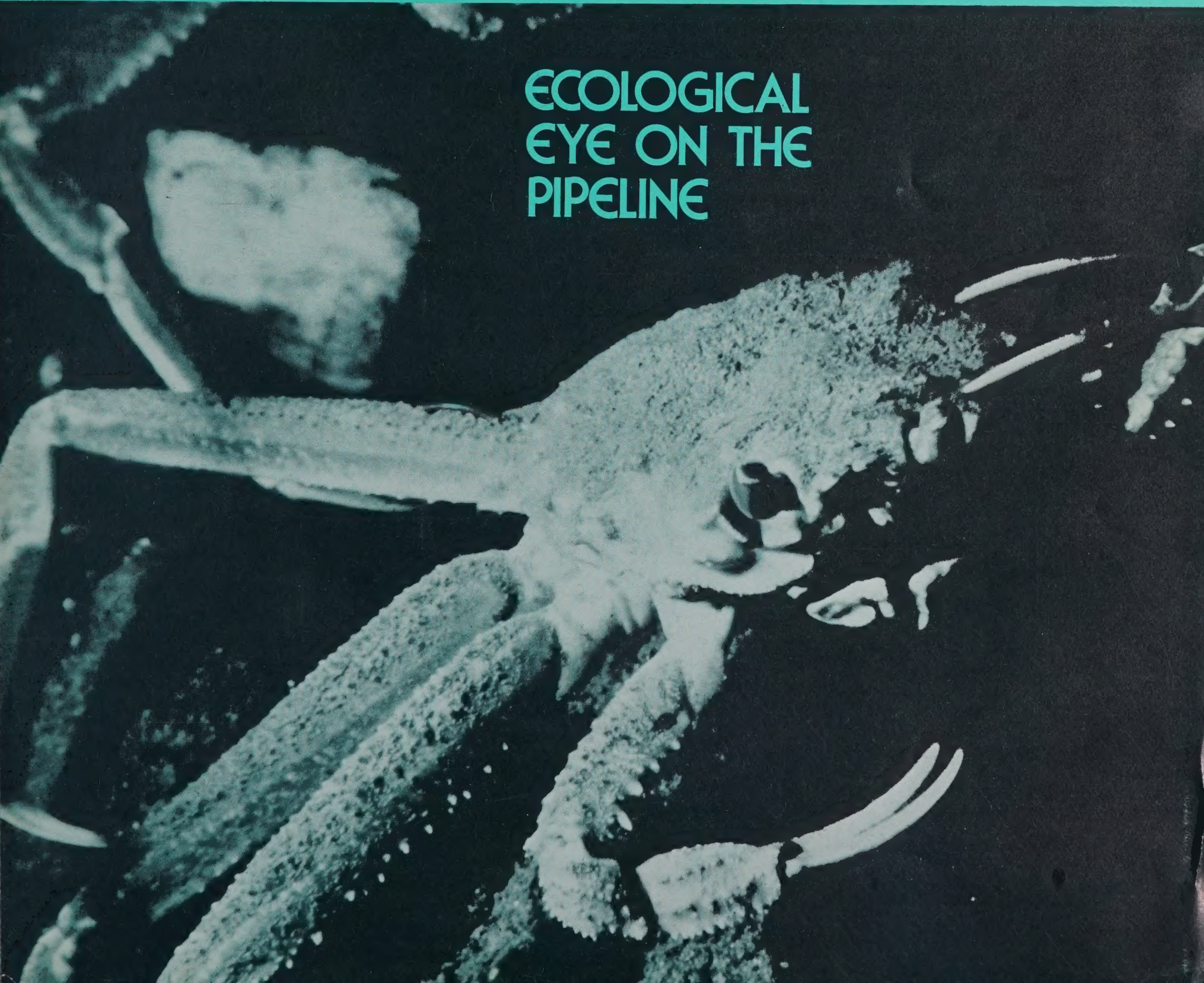
THE TECHNICAL NEWS BULLETIN OF THE NATIONAL BUREAU OF STANDARDS / FEBRUARY 1974

DIMENSIONS NBS

A PUBLICATION OF THE UNITED STATES DEPARTMENT OF COMMERCE



ECOLOGICAL EYE ON THE PIPELINE

NATIONAL BUREAU OF STANDARDS

DIMENSIONS NBS

FEBRUARY 1974 / Vol. 58, No. 2 / ISSUED MONTHLY

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Nat. Bur. Stand. (U.S.) *DIMENSIONS/NBS*
CODEN: NBSTAR 58(2)25-48

Superintendent of Documents Catalog No. C13.13:58/2

Library of Congress Catalog No. 25-26527

Cover: The Alaskan crab is one of thousands of marine specimens being examined by NBS and NOAA scientists to establish natural levels of crude-oil hydrocarbons. This baseline study will make possible long-range monitoring of changes that may occur after the Alaskan pipeline is in operation. See article on page 36.

AMERICAN REVOLUTION BICENTENNIAL
1776-1976

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NATIONAL BUREAU OF STANDARDS
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The National Bureau of Standards serves as a focal point in the Federal Government for assuring maximum application of the physical and engineering sciences to the advancement of technology in industry and commerce. For this purpose, the Bureau is organized as follows:

The Institute for Basic Standards
The Institute for Materials Research
The Institute for Applied Technology
The Institute for Computer Sciences and Technology
Center for Radiation Research
Center for Building Technology
Center for Consumer Product Safety

Formerly the TECHNICAL NEWS BULLETIN of the National Bureau of Standards.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Annual subscription: Domestic, $6.50, foreign, $8.25, single copy, 65 cents. The Secretary of Commerce has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through June 30, 1976.

HOW SAFE ARE CONSUMER GOODS?

HOW much faster and more easily can I cut the yard with that new power mower? How many more interesting dishes can I prepare with this particular electric mixer-blender? Will that new liquid product really restore the finish of my old furniture?

Everyone who purchases a consumer product has certain expectations regarding its performance. These expectations are perhaps based on advertising or manufacturer's claims, or even the price paid for the product. But one expectation is very nearly universal with every purchaser and for nearly every consumer product: An assumption that the product will present no unreasonable risk or hazard if operated properly and if used for the purpose for which it is designed.

Unfortunately, in too many instances, this assumption is proven tragically in error. It has been estimated that up to 20 million Americans are injured in the home each year as a result of incidents related to consumer products. Of these, 110,000 are permanently disabled, and 30,000 are killed. The annual cost of product-related injuries may well exceed $5.5 billion.

In an effort to reduce this accident toll, Congress passed the Consumer Product Safety Act in October 1972, creating an independent Commission with broad powers to develop and enforce uniform safety standards for consumer products and to ban unreasonably hazardous products from the market. The Consumer Product Safety Commission was directed, insofar as practical, to "utilize the resources and facilities of the National Bureau of Standards . . . to perform research and analyses related to risks of injury associated with consumer products, to develop test methods, . . . and to provide technical advice and assistance in connection with the functions of the Commission."

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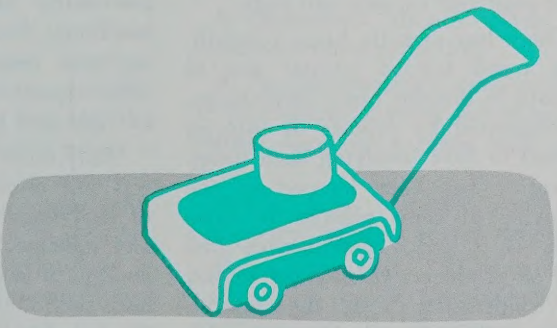
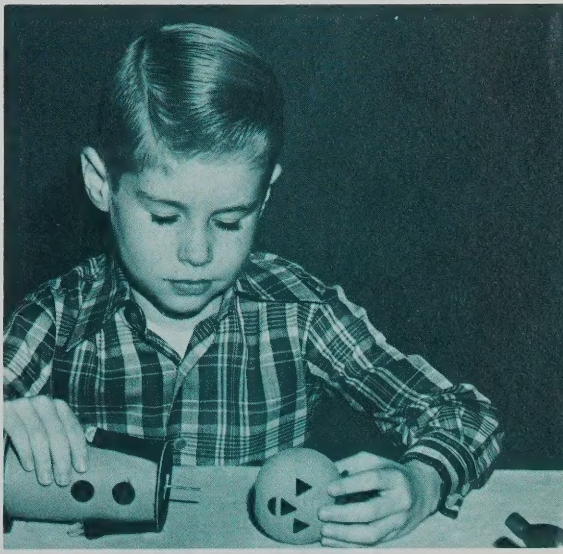




Many products contain hazards that are hidden from the consumer. For example, 5-year-old John D. Moore, Jr., above, demonstrates the ease with which the head can be removed from a cardboard pumpkin doll to reveal a dangerously sharp nail.

NBS Center for Consumer Product Safety

Within the NBS Institute for Applied Technology, a Programmatic Center for Consumer Product Safety has been organized to administer a variety of projects, many of which support the work of the Consumer Product Safety Commission.

Dr. Melvin R. Meyerson, Associate Director of the Center, cites the complexity of many modern products as one reason why even the very safety-conscious consumer may be unable to anticipate and avoid some product hazards. "You simply can't tell by looking at a refrigerator or a television set whether it presents a problem of current leakage and an electrical shock hazard," said Meyerson. "The consumer is in the best position to decide whether various features of an appliance and its cost make it likely to meet his own particular needs and pocketbook. However, when it comes to safety he must often rely upon the designer's skill and the integrity of the manufacturer."

Mechanical Hazards

Product hazards may take many forms and NBS researchers are involved in studying their causes and effects and the best means for preventing many of them. Some hazards may be termed mechanical in nature as, for example, sharp points and edges. Obviously, sharp edges and points found on some products, such as toys, may lead to accidental injuries. Studies are being conducted to determine the relationships between forces, velocities and dimensions of objects capable of inflicting injury to the human body. Such information is basic to safe design for many products.

Sports and Recreation Equipment

Many accidents are associated with sports and recreation. In some cases, better designed sports equipment might have prevented an injury or reduced its severity. Head injuries are a relatively common—and serious—occurrence in football, hockey and other sports. In order to provide the technical basis for design of better protective headgear, NBS researchers are developing a realistic model of the human head, neck and body. This model will be used to determine the capabilities of the human head to attenuate shock. The results should suggest methods for improved helmet design.

Thermal Hazards

Thermal hazards leading to burn injuries are known to cause some of the most painful, disfiguring and lethal of all product-related accidents. NBS is supporting the Consumer Product Safety Commission in its responsibilities under the Flammable Fabrics Act, through continuing efforts to reduce fabric flammability and to set or amend flammability standards for such products as upholstered furniture, children's sleepwear and carpets and rugs.

There has recently been a significant trend toward greater use of plastics in interior home furnishings, accompanied by reports of injuries related to fires involving such items. Attention has been focused on the behavior of some plastics in fires, both as a highly combustible fuel and as producers of noxious smoke. In cooperation with the plastics industry, NBS is undertaking a major study of the flammability characteristics of various kinds of plastics. Much of the information gained from the study may be used in developing flammability tests for plastics used in consumer products.

Noise Control

An increasing number of laws, regulations and ordinances are imposing limitations on the amount of noise that may be generated by various consumer products. Such efforts to control noise are intended to protect from hearing damage and to reduce community "noise pollution." In some cases, regulations may be insufficient to provide ear protection, while some regulations may duplicate noise abatement requirements of other governmental agencies and result in unnecessary effort and expense. In order to help avoid noise regulations that are either insufficient or superfluous, NBS researchers are surveying existing noise legislation and, where necessary, making recommendations for change or coordination among regulatory agencies.

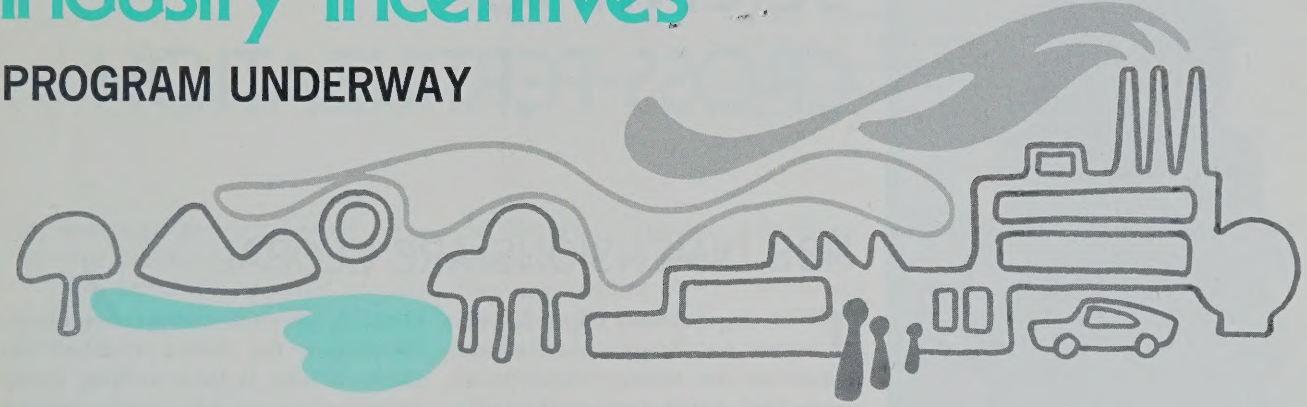
Glare from Consumer Products

Some products, such as power tools, may contain light sources or may have highly polished surfaces that can reflect sunlight, causing distraction or momentary blindness. A serious injury may be caused if the operator of a power saw, for example, is momentarily blinded by light reflected from the saw blade, causing him to lose control of the tool. Potential hazards of this nature are being identified by NBS researchers. Studies involve determining how human reaction time and other aspects of behavior are affected by light and glare.

Many other consumer-related projects are underway involving safety of such disparate products as bicycles and matches, playground equipment and space heaters. But all are in the long NBS tradition of helping bring the benefits of science and industry to the public, while promoting honesty and safety in the marketplace. ☐

Industry Incentives

PROGRAM UNDERWAY



TECHNOLOGY plays a key role in the Nation's socio-economic system. U.S. industry competes most effectively in world markets when it has a technological advantage. Further, the profound impact of technological change on productivity in the manufacturing and service sectors has been clearly demonstrated by the adoption of innumerable technological advances such as computers in banking and new steel production methods. Continued improvements in our quality of life, whether in health care delivery, the environment or public safety, impose both constraints upon and demands for continued technological change.

To encourage this needed innovation, the National Bureau of Standards, through its Experimental Technology Incentives Program (ETIP), and the General Services Administration (GSA) are testing the feasibility of using procurement policies as incentives for industry to develop products that represent significant technical advances and improved performance of products presently available. In the first test of this program, GSA's purchasing power is being used as leverage to determine if private companies can be influenced and encouraged to develop and use noise suppressing technology in the manufacture of powered 21-inch rotary lawn mowers. GSA has announced that it plans to purchase at least 10,000 of these quieter mowers in the fiscal year 1975 from one or more manufacturers whose products meet the specified levels of performance. Only specific measurable levels of performance are required, leaving manufacturers free to use their creativity in meeting these goals.

The 10,000 mowers involved are but a small fraction of the more than 5 million units representing the national market. However, Ralph Barra, Chief of the ETIP procurement program at NBS, reports that, "The innovations stimulated by the experiment could move into the private market within 3 years."

Power lawn mowers were selected for this initial experiment because:

- Their noise level is a significant annoyance in most neighborhoods, and, as illustrated by the Noise Control Act of 1972 and local noise ordinances, the reduction of noise pollution is a national goal.
- Technology already exists for significant noise reduction.
- The government's usual method of purchasing mowers is suited to putting together a large bulk purchase.
- The bulk purchase could be sufficiently large to attract suppliers.

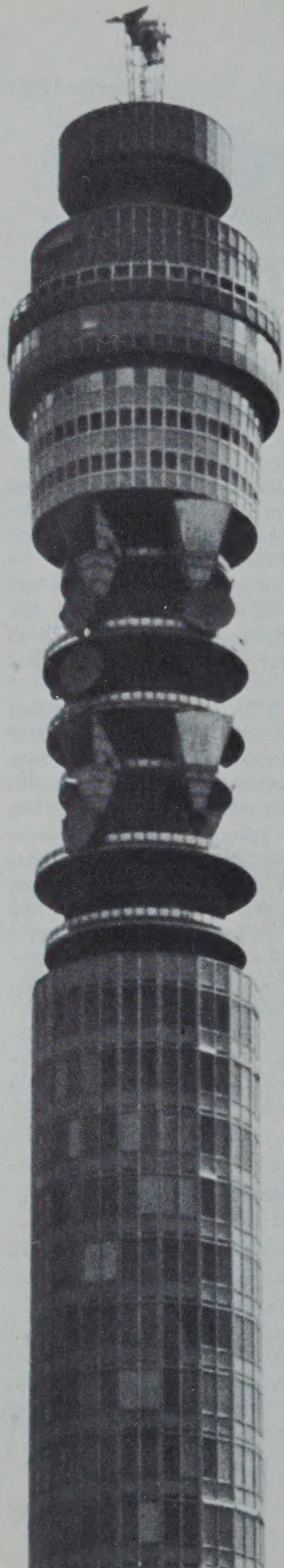
Barra says that, "ETIP will be watching to see if the innovations stimulated by the experiment reach the private market faster because of this government purchasing action." If they do, and if other experiments using similar procurement tools also result in accelerating the introduction of desirable innovations, then these learning experiences could lead to an ETIP recommendation that these procurement tools be used as a matter of Federal procurement policy.

The ETIP effort was established at NBS in conformance with President Nixon's technology message to Congress of March 1972. It is designed to explore ways in which the Federal government can work as a more effective partner with private industry in developing and applying science and technology to strengthen the Nation's economy and improve the quality of life.

ETIP seeks to identify actions that the Federal government can take to increase the rate at which new technologies are introduced into the private marketplace. Areas in which ETIP is attempting to formulate incentives to accomplish this include:

- Federal procurement policies and practices.
- Federal regulatory practices.
- Public support of civilian R&D.
- Encouragement of small technology-dependent firms.

In each area, new or modified Federal policies, programs and practices are being investigated in cooperation with responsible Federal agencies and industry groups. □



SCIENTIFIC CROSS-FERTILIZATION

NBS DIMENSIONS ARE GLOBAL

TWO trips abroad taken 72 years apart can be examined as indicators of the history, development, scope and future impact of the National Bureau of Standards' international activities.

Dr. Samuel W. Stratton, first NBS director, sailed for Europe in April 1901, some 3 months before the Bureau officially opened its doors. His mission was to place orders for scientific equipment in Paris and Berlin and visit French and English laboratories. America, although it was then emerging as a leading industrial power, was still largely a "have not" nation when it came to measurement research and physical standards.

Dr. Richard W. Roberts, seventh and current NBS director, led a scientific team to the Soviet Union in September 1973. It was a visit by one advanced country's leaders in research and technology to opposite numbers in another advanced country. It afforded excellent opportunity for comparing notes not only on their respective attainments on scientific frontiers but also on the differing organization and direction given to science and technology under contrasting governmental systems. Shortly before the Soviet visit of the Roberts team, a joint working group on metrology and standardization concluded its first sessions in Washington and reported to the U.S.-U.S.S.R. Joint Commission on Scientific and Technical Cooperation.

London's Post Office Tower is a focal point for research into wind effects on high-rise buildings. With the cooperation of England's Building Research Establishment staff, the NBS Center for Building Technology is instrumenting the Tower for the wind studies.

Two-Way Traffic

Obviously, much has changed in the nearly three-quarters of a century between these trips by NBS directors. The pathways of scientific and technological cooperation are much broader, the traffic in ideas and know-how in both directions—to and from the United States—heavier. NBS today has working agreements not only with Russia but also with France, Argentina, the Republic of China, Canada, Japan, Australia, Romania and other countries. The Bureau's Office of International Relations (OIR) is a coordinating center for NBS interaction with science and technology leaders from other countries, and the volume of the two-way "flow" is barely suggested by the fact that OIR annually facilitates the visits of five or six hundred foreign scientists, engineers, industrialists, and government officials. The Bureau's Office of Engineering and Information Processing Standards reports that over 300 NBS staff members are active on more than 1,100 committees concerned with developing national and international standards and with increasing attention to making these standards "mesh" with world patterns. Indeed, practically all NBS divisions participate in some way in work having international ramifications.

"This technological world of ours is on the move," says NBS Director Roberts, "and we're not about to tell it to 'stop, we want to get off.' As we pursue good relations and effective cooperation with other countries, we need to exercise more imagination and leadership in obtaining international agreement on basic standards and on engineering and product standards.

"In the international harmonization of standards, we have to go where the action is. The question of metric conversion points up America's increasing readiness to make significant adjustments. The Administration has endorsed the goal of a coordinated national changeover and recommended that the Congress take appropriate action. In any event, with or without a formal policy, millions of Americans in school, factory or marketplace are getting the 'hang of metric' in some parts of their daily routine. Many other steps need to be taken toward the goal of equitably harmonized standards, and as NBS strengthens its ties and improves its coordination with the world scientific community, we can better understand what the needed steps are and how, when and where to take them."

Pattern Set by the Founders

The Bureau's international activities under Roberts are in a direct line of development from Stratton's early voyage to the Continent in search of instruments, standards and know-how. Stratton himself, in looking overseas, followed the pattern of more than a century established by the Republic's founding fathers and reinforced by periodic Congressional directives calling upon government officials to regulate U.S. measurement standards "relative to the proceedings in foreign countries for establishing uniformity in weights and measures . . ." The standards vault of the NBS museum at Gaithersburg has on display historic world standards, including a replica of the ancient Egyptian royal cubit and numerous standards of capacity, mass, length, luminosity, and electrical resistance from England, France, and Germany. Among various meter bars in the display case, there is a copy of the platinum-bar "Committee Meter," elaborately produced on the basis of "extensive geodetic and astronomical measurements along a meridian from Dunkirk to Barcelona using the toise, an old French unit of length"—but later discarded in favor of a more suitable international prototype.

Louis A. Fischer, who came to NBS from the Coast and Geodetic Survey's Office of Standard Weights and Measures, became the Bureau's first resident expert in international metrology and for the next 20 years—until his death in 1921—strove for harmonization at home and abroad. His work at the International Bureau of Weights and Measures (BIPM) on the recomparison of meter bars helped to provide a basis for thorough comparison of all national prototypes with the international standard.

The United States was one of the 17 countries signing the Treaty of the Meter in 1875. Under the treaty, several international activities have been established to promote global

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An NBS disaster research team visiting Managua, Nicaragua, in the wake of its December 1972 earthquake inspected many badly demolished buildings. NBS experts in the Center for Building Technology are convinced that building designs that would help prevent severe structural damage from extreme shocks can and should be formulated.

agreement on units of measurement —the General Conference on Weights and Measures (CGPM), held every 3 to 6 years as an intergovernmental conference of member states; the International Bureau of Weights and Measures (BIPM), laboratory arm of the International Committee on Weights and Measures (CIPM) which provides an international forum for discussion of definitions and for other technical activities; and seven CIPM consultative committees (CC's).

NBS specialists are serving on CC's dealing with electricity, photometry, thermometry, the meter, the second, ionizing radiation, and units. Among major accomplishments of the past decade have been the initiation and development of the modernized metric system, known as the Système International; adoption of the International Atomic Time Scale; application of the Josephson Effect to voltage standardization; laser intercomparisons; and establishment of a new reference base for the "g" (gravity) network—important in space science and other applications.

Working-Level Participation

NBS is stepping up its committee participation in leading international organizations: in the International Organization for Standardization (ISO) which meets in committee sessions somewhere in the world every calendar working day; in regional economic organizations such as the Organization for Economic Cooperation and Development (OECD); in the International Union of Pure and Applied Chemistry (IUPAC); and in many others.

Shifting from an "interested observer" status to full-fledged participation, the United States in the fall of 1972 became the 38th member nation of the International Organization of Legal Metrology (OIML). This organization promotes intergovernmental cooperation to bring about more compatible measurement standards as determined by legislation and government regulations. For the United States, membership provides opportunity to influence OIML-drafted model codes and laws so that American technical expertise may be reflected in international standards and U.S. products can move freely in world trade. NBS is assigned general responsibility for the development of U.S. positions on OIML technical matters. These technical matters, exemplified in the 42 model regulations thus far adopted, run the gamut from petroleum meters to taxi meters and from precision scales to clinical thermometers.

In cooperation with international science specialists of the Department of State, NBS works increasingly on matters dealing with the European Economic Community (EEC), the Organization for Economic Cooperation and Development (OECD), the World Health Organization (WHO), the United Nations Industrial Development Organization (UNIDO) and others. For example, an NBS economist serves as a consultant to the OECD, and NBS is helping collect information for a survey of government incentives for technological innovation. In UNIDO activities, NBS specialists participate in conferences on standardization in developing countries. NBS specialists provide technical support to the Departments of Commerce and State in their participation in meetings under the General Agreement on Tariffs and Trade (GATT), particularly on the question of technical restrictions that create non-tariff barriers to trade.

Toward Harmonization

When "our" standards and "their" standards are incompatible, the results are often costly—witness the limitations in the marketability in Europe of American-made TV sets because of differing color TV standards. When satellite communication became possible, complex converters had to be introduced to allow international interchange of programs. European use of a color TV system not compatible with ours also means that U.S. programs cannot be taped here and fed directly into European transmitters.

NBS and non-government organizations like the American National Standards Institute (ANSI) work for international harmonization to put an end to technical trade barriers. The best solution is for U.S. technical experts to be on working committees where the action is, as engineering and product standards are formulated. Distances between buyer and seller shrink when mutually agreeable and mutually understood standards are adopted—standards that describe products that the buyer can specify and the seller can supply. Because the U.S. effort is still largely private in nature, Congress is considering legislation that would clarify agency roles in the promotion of international voluntary standards cooperation. NBS is the Department of Commerce's technical support in this area and will be a major resource for mounting a stronger U.S. action program.

Less Developed Countries

Technical cooperation with industrializing nations is an essential ingredient in NBS international activities. Such cooperation is of mutual benefit—the developing nations sharing in NBS expertise and technology, NBS benefiting from opportunities to study how measurement services stimulate technological development or to work in "natural" laboratory environments not available at home.

Many projects are part of the Bureau's Special Foreign Currency

Program (SFCP), using nonconvertible funds owed to the United States for the purchase of agricultural commodities and other goods. Other programs are sponsored by the Agency for International Development (AID). NBS collaborates on a whole spectrum of problems, from the very broad to the very specific—for example, advising Ethiopia on how to plan for the establishment of a national laboratory, improving the quality of rubber from Thailand, consulting with Israeli specialists on trace analysis, dealing with corrosion problems in Kuwait and studying surface characteristics of glasses in Yugoslavia.

The "cross-fertilization" process in action is well illustrated by some recent U.S.-Ecuador-Turkey-Korea teamwork. Scientists from each of these countries participated along with NBS scientists on NBS/AID survey teams dealing with measurement services standardization in each of the three countries.

"Natural" Laboratories

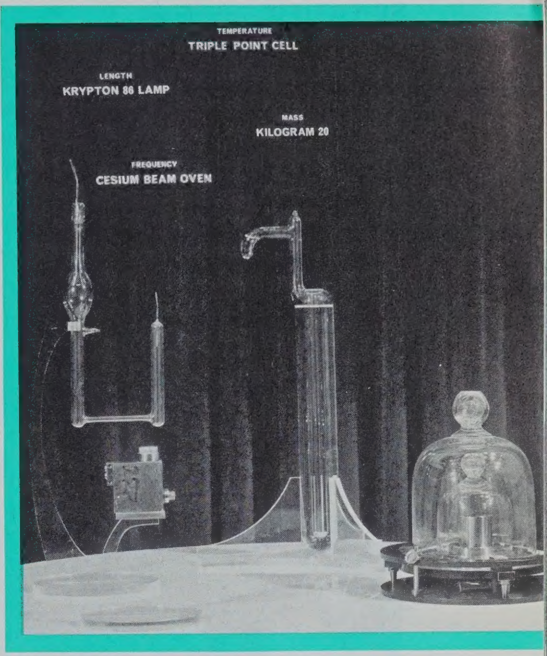
Exactly where and when NBS research teams are sent to set up shop for international collaborative work is often dictated by simple logic. The world yearns, for example, for improved building technology and standards so that people can live and work in structures that will stand up to winds, floods, earthquakes and other natural disasters. The state of the art varies from country to country and the vulnerability to particular types of disaster also varies—according to the frequency of hurricanes, tornadoes, monsoons, tsunamis or what have you.

Accordingly, the NBS Center for Building Technology (CBT) is supporting AID by helping to improve housing design criteria in developing countries where high winds and earthquakes are common.

With regard to wind effects on buildings, the Philippines offer a "natural" laboratory for studying the problem. Researchers there find "a high frequency of tropical storms that you can count on for experimentation," as one CBT staff member puts it. NBS engineers enhance their chances for being in the right place at the right time by basing their experimentation timetable on a mean-monthly-frequency chart of Philippine tropical storms. With the cooperation of the Philippine Advisory Committee for the AID project, seven full-scale houses will be instrumented to record the wind effects of each storm as it roars down the track. This information will be correlated with data from wind-tunnel models of the houses. CBT consultations in Bangladesh and Jamaica are also part of the project.

Similar considerations have led to the selection of Peru, Turkey and Iran for other AID projects with NBS technical support related to both wind and earthquake effects on buildings.

In another project, England's Building Research Establishment staff is working with NBS/CBT in a related cooperative program, supported by NBS research and technical services funds. This program involves instrumentation and study of high-rise buildings such as London's Post Office Tower, as well as low-rise buildings.



International cooperation has led to the use of four basic prototype units to derive all units of measurements. Displayed in an NBS museum vault are representative parts of the equipment used to realize these units: (left to right) the krypton-86 lamp for length, the cesium-beam oven for time, the triple-point cell for temperature and the kilogram for mass.

Some International Aspects of Computer Technology

The NBS Institute for Computer Sciences and Technology (ICST) is actively participating in a variety of international activities. These range from projects aimed at providing assistance to foreign nations in specific applications of computers to general support for AID and participation, through the American National Standards Institute, in the ISO.

NBS provides the U.S. representation to the OECD Computer Utilization Group (CUG) which was established in 1968. The goals of this group include the promotion of exchange among OECD member countries of experiences in the development and implementation of policies related to computer technology and the coordination of research activities. Recent subjects of study have included computers and telecommunications, information technology and public administration, and education.

The ICST has begun an informal cooperative program with its equivalent French organizations, the Delegation Informatique and the Institut de Recherche d'Informatique et d'Automatique (IRIA), coordinated through the French Scientific Mission. Common areas of interest have been identified, including computer security, management and technical

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aspects of ADP standards, computer applications in health and medical care, computer networking, systems architecture and problems of software documentation.

The ICST is also providing technical support to the Department of Commerce representatives and others involved in planning for the working group on Application of Computers in Management under the auspices of the U.S.-U.S.S.R. Joint Commission on Scientific and Technical Cooperation. NBS has been designated as a participant in this group's work directed toward developing a theoretical foundation for the design, development and production of software. Personnel of ICST have met with the Russian team that visited Washington in October 1973 and had preliminary discussions concerning the identification of appropriate projects within this task area. Continued coordinated planning followed by some form of technical cooperation is expected in the months ahead. The Institute has also been participating in the computer and automation subject areas of the working group in Metrology and Standardization.

Separately from the bilateral agreements, the U.S.S.R. has requested that NBS provide magnetic disk calibration services to them. The ICST has agreed to make such services available on a cost-reimbursable basis upon formal application by the U.S.S.R.

Visiting Russian scientists observe a computer demonstration by Zane Thornton, Deputy Director of the NBS Institute for Computer Sciences and Technology, while Dr. Walter L. Sadowski (pointing) serves as interpreter. The visitors were members of a joint working group on metrology and standardization reporting to the U.S.-U.S.S.R. Joint Commission on Scientific and Technical Cooperation.

A Look Ahead

These have been a few of the highlights on the broad canvas of NBS international activities. Working at this canvas are scientists, engineers and administrators representing most parts of NBS/Gaithersburg and NBS/Boulder.

Stepping back from the canvas to look at the panorama in deeper perspective, NBS Director Roberts spells out these major objectives in the Bureau's organized global effort:

- NBS has responsibility, not just to participate, but to take a leadership role in efforts to obtain international agreement on basic standards.
- NBS has responsibility to aid U.S. industry in promoting acceptance of U.S. technology and products through international product standards.
- NBS cannot pursue all interesting and potentially useful lines of research within our mission and should collaborate with other major national laboratories to share work loads and results.
- NBS is a major technical resource of the Federal Government and should respond to requests of other agencies for technical support. This includes:
  (a) helping A.I.D. promote the development of technological infrastructure of developing countries;
  (b) helping the Dept. of State provide technically sensible responses to socio-technical problems it encounters in many arenas;
  (c) helping Office of Export Control and other agencies devise reasonable policies for international trade.
- NBS has responsibility to maintain a current awareness of scientific and technological developments in other countries to ensure that our domestic mission is adequately responded to.
- NBS should build up its contacts with ideas and methods of other countries as essential to intellectual development of NBS staff.

Roberts says, "For the United States, and for all the countries involved, the stakes are high—increased productivity, expansion of trade, lower prices, a better quality of life—all coupled with a more rational system for directing technological progress." ☐

HIGHLIGHTS

Pollution-Monitoring Standards

A third series of Standard Reference Materials (SRM’s) for mobile-source emission analysis is now available from the NBS Office of Standard Reference Materials. Five concentrations of carbon monoxide in nitrogen comprise this series of SRM’s.

While the SRM’s were developed in a cooperative effort with the Environmental Protection Agency to provide standards needed for monitoring compliance with automotive emission laws, they have a much wider potential use. Two mixtures are in concentration ranges concerned with the National Ambient Air Quality Standards, and four are related to standards of the Occupational Safety and Health Administration.

Magnetic Disk Calibrations

NBS announces a calibration service for low-density magnetic disk surfaces of the type used in the six-high disk pack. The disk packs are used as high-speed random access memory devices for the magnetic storage and retrieval of digital information for electronic computers.

This service is being offered in support of related American standardization activities and was developed in response to requests from various disk users and suppliers. Arrangements for this calibration service can be made by contacting Nicholas Goumas, NBS, B204 Technology Building, Washington, D.C. 20234.

Noise Standards

The Bureau has published a collection of short descriptions of noise standards issued by the various standards-writing, industrial and trade organizations concerned with acoustics. A wide range of topics is covered, including measurement techniques, calibration methods, equipment and product specification, rating schemes, definitions and subjective measurements and responses to noise.

Copies of the 91-page publication are $1.10 from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20234. Order as SD Catalog No. C13.10:386.

Analyzing Hydrocarbons

A new device and procedure for determining concentrations of hydrocarbons in sea water has been developed at the Bureau. In this procedure, a known volume of hydrogen, generated by electrolysis and dispersed as very small bubbles, is passed through the water sample and a chromatographic analysis is carried out on the gas phase. The method minimizes losses of hydrocarbons by wall adsorption, avoids introduction of impurities, avoids simultaneous extraction of non-volatile organic substances and is considerably faster than conventional methods.

Automatic Typesetting

NBS has released to the general public a general purpose computer program with a proven performance over the last 4 years in preparation of magnetic tapes for phototypesetting scientific publications. Included in these publications were: complex tables of line classifications for certain atomic ions; thermodynamic properties for moist air; heat capacities for copper, silver and gold; and critical micelle concentrations of aqueous surfactant systems.

Designed especially to handle the complex notations in the field of atomic spectroscopy, this program has been used to phototypeset approximately 700 pages at a savings of $25,000.

The program is described in NBS Technical Note 740 and is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, by SD Catalog No. C13.46:740 for 55 cents prepaid.

New Calibration Service

A new service for calibrating optical lenses is now available from NBS. This service includes the measurement of the monochromatic, on-axis pupil function (wavefront), optical transfer function, and aberrations for infinite or finite conjugates of the test lens.

For information on the lens calibration service, contact John Jerke, NBS, A123 Metrology Building, Washington, D.C. 20234. Telephone: 301/921-2185.

Marine Pollution Monitoring

Experts from 75 nations will meet May 13-17, 1974, at NBS Gaithersburg to explore mutual problems and work out guidelines for standardized oil pollution measurement techniques and develop criteria for oil-in-water and oil-in-biological-tissue SRM’s. The symposium-workshop is cosponsored by three Department of Commerce agencies—NBS, the National Oceanic and Atmospheric Administration and the Maritime Administration.

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SCIENTISTS FIGHT CHILBLAINS AND THE CLOCK IN

ALASKAN OIL BASELINE

Right: *Collection bucket at the ready, Dr. Stuart Cram goes amphibious as he digs for natural quarry in pre-dawn hours.*

Far right: *Slickers, hip boots, shovels and sieves are essential for the NBS/NOAA team searching Prince William Sound, Alaska, for representative samples of marine life and sediment.*

TUDY

Part of a teeming shellfish colony is added to the voluminous marine assortment being studied by the NBS/NOAA team.

GOVERNMENT scientists have just returned from fighting chilblains and backaches in frigid Alaskan waters as they worked on a complex chemical baseline study of the marine environment.

The investigative team plans to return to Prince William Sound this spring to continue collecting sediment samples and marine life on a timetable that calls for completion of the study before construction of the Alaskan pipeline, scheduled to begin this year.

Scientists conducting the collaborative study are from the Commerce Department's National Bureau of Standards (NBS) and the National Oceanographic and Atmospheric Administration (NOAA).

The purpose is to establish natural levels of crude-oil hydrocarbons, measured in parts per billion, in the biological specimens and thus provide reference data for measuring changes that may take place when the pipeline is in operation.

The ability to measure these changes will be an important factor as the pipeline's long-term economic, social and legal impact on energy problems and the ecology is appraised.

The study, headed by Dr. Stuart Cram, an NBS chemist, and Dr. Herbert Bruce, an Alaska-based NOAA oceanographer, affords an unusual opportunity for scientists to characterize an ecological system before the development of a major environmental impact.

It is estimated that tanker traffic will be transporting as much as 2 million barrels of crude oil a day through the Sound when the pipeline project is completed.

Alaska is a unique natural laboratory for this kind of research because its marine environment is virtually pristine. The only significant oil contamination in Alaska resulted from leakage due to the 1964 earthquake and the study's findings will be of particular interest to Alaska's commercial fisheries industry.

The NBS/NOAA team is collecting sediment samples as well as crabs, herring, clams, mussels, limpets and algae. The different species of marine life are representative of different feeding habits and physiological behavior and serve as good potential indicators of crude-oil accumulation at sub-lethal levels.

Field sampling is carefully done to minimize analytical errors. Samples are collected at low tides and from areas in which the population or distribution of a species will not be disturbed. Special sampling methods and techniques have been developed to avoid contamination of specimens.

The methods include a "quick freeze" and specimen storage over dry ice within minutes after sampling. Bacteria-free collection bottles are used. Dry ice, equipment and supplies must be trucked long distances over mountains for transfer to the research vessel.

Route to be taken by the Alaskan Pipeline is indicated by heavy line.

As an example of the painstaking work involved, a single trace organic analysis of macoma clams requires that more than 10,000 of these clams be collected and hand-sorted from algae, rock and more than 20 cubic meters of tidal silt and sediment.

Gas chromatographic methods will be used to accurately measure hydrocarbon concentration changes by species, geographical location and seasonal variation. The Alaskan samples, brought to NBS laboratories at Gaithersburg, Maryland, are being analyzed by techniques specially developed at NBS for the purpose. These include high-resolution computer-automated gas chromatography, high-pressure liquid chromatography and gas chromatography-mass spectrometry. To isolate the crude-oil hydrocarbons from biological tissue, NBS has devised additional techniques representing the best approach to the project's needs.

Alaskan hydrocarbon concentrations as small as a hundredth of a part per billion will be measured by these sensitive and selective techniques.

Follow-up field studies by the NBS/NOAA team may take them to the north slope, into many of Alaska's hundreds of salmon-spawning streams, or along the Continental Shelf as new areas of oil exploration are developed. ☐

Measuring The National Measurement System

WHAT part of the gross national product is the result of measurement-related activity?

An answer to this question, based on a large and reliable body of evidence, is one of the principal objectives of a study nearing completion at the National Bureau of Standards. The purpose of the study is to provide the background information needed for broad policy decisions affecting long-range program planning. That is, it aims to identify the various elements in the National Measurement System (NMS)—the people, industries, laboratories, instrumentation and techniques relating to measurement—and to understand its human and economic dimensions.

This modern "systems approach" makes use of social data, economics and statistical methods of the kind known as "operations research."

A close look is being taken first at the NMS as a whole, in its national and world setting. Attention is further being concentrated, in a series of "microstudies," on 21 measurement areas of special importance. Reports on these microstudies will be published in the course of the year, beginning, it is expected, with those on flow, humidity and force.

Directing the effort is Dr. James Seed of Dow Chemical Corporation, assigned to NBS for 16 months as a Presidential Interchange Executive. Dozens of others at NBS, mainly from the Institute for Basic Standards, have participated, as have economists from the NBS Office of Programs. Indispensable input has been provided by the U.S. Department of Labor and by member firms of the National Conference of Standards Laboratories (NCSL).

MICROSTUDIES

As part of the survey of the National Measurement System, in-depth studies are being made in the following measurement areas.

Length & Related Dimensional Measurements
Volume & Density
Temperature
Pressure & Vacuum
Time & Frequency
Acoustics
Vibration & Shock
Force
Humidity
Flow
Optics
Electricity
Surface Finish
Vacuum UV Radiation
Spectrophotometry
Radiometry & Photometry
Quantum Electronics
X- and Nuclear Radiation, Dosimetry
Cryogenic Material Properties
Electromagnetic Radiation

The Systems Approach

Present-day economic stresses and interactions, social organizational patterns, technology, and national world political structures and psychology all interact in such a complex mode that even apparently simple structural relationships cannot be understood unless we deal with an entire "system."

Like other social-economic systems, such as the financial and transportation systems, that are absolutely necessary for commerce and technological growth, the measurement system is dynamic—rapidly changing in time. Its infrastructure must adjust to economic trends, national priorities and technical innovation.

To facilitate this necessary adjustment, therefore, and to clarify our goals and achieve them in the face of shifting constraints, we must continually appraise the System's current definition, scope, infrastructure, communication channels, economic dimensions and impact. This defines one overall objective of the NBS study.

The first attempt to grasp the outlines of the NMS was made in 1966 by Dr. Robert D. Huntoon, then Director of the Institute for Basic

Standards. His analysis is summarized in his article, "Concept of a National Measurement System" in *Science,* October 5, 1967, pp. 67–71. The study described here is an expansion and updating of Huntoon's pioneer work.

The Overall Picture

The first phase of the study asked the question: What is the economic role of measurement within this country? Fortunately, a great deal of information of the kind needed to answer this question is available in the Department of Labor's massive collection of data on job profiles. Trained observers from the Labor Department have visited over 6,000 establishments and studied in detail the nature and proportion of time alloted to different tasks, including measurement-related activities. They have also recorded the machines, tools and equipment used to perform various tasks. These data were generously made available for the study.

A sophisticated treatment of this data showed that in 1973 measurement-related activities would be in excess of $70 billion, or about 6 percent of the GNP. Over 90 percent of this figure is directly attributed to labor costs, the rest going for equipment, tools and other aids.

The assumptions made in this assessment were deliberately conservative. Any uncertainty that might remain about the $70 billion figure would not alter the inescapable conclusion that the NMS is a huge factor in the American economic system. These figures will give those engaged in measurement a realistic feeling for the current magnitude of the national measurement commitment. They also provide a baseline against which to judge future trends. As the Labor Department constantly updates its figures, successive assessment of the NMS could reveal trends or possibly show the impact, if any, of program changes at NBS.

Standards Laboratories in Industry

As assessment was also made of the economic "clout" of NCSL companies and laboratories. The estimate is based on data supplied by 60 NCSL members coupled with data from Dunn and Bradstreet and some educated guesswork. One result is that NCSL parent companies had total sales in 1972 in excess of $313 billion. On a value-added basis, this amounts to about $200 billion or 15 percent of the GNP.

More relevant, however, is the value added by the specific elements or divisions that NCSL laboratories directly serve, rather than the total corporate structure within which the laboratories are located. A realistic estimate of this direct contribution to the economy is $20 billion or 1.3 percent of the GNP. Another finding is that NCSL companies spend about $230 million each year to support their laboratories calibration and standardization activities. That is, only $230 million worth of measurement services impact directly on $20 billion of the GNP.

A Sample Microstudy

The analysis of the Fluid Flow sector of the NMS was conducted by the NBS Mechanics Division. This example of a measurement-system microstudy is made more appropriate by sector-wide Conference on Flow Measurements as Related to National Needs, meeting at NBS this month (February 26 to 28).

For the Flow study, over 200 contacts were made with trade associations, private companies, universities, measurement laboratories and other government agencies.

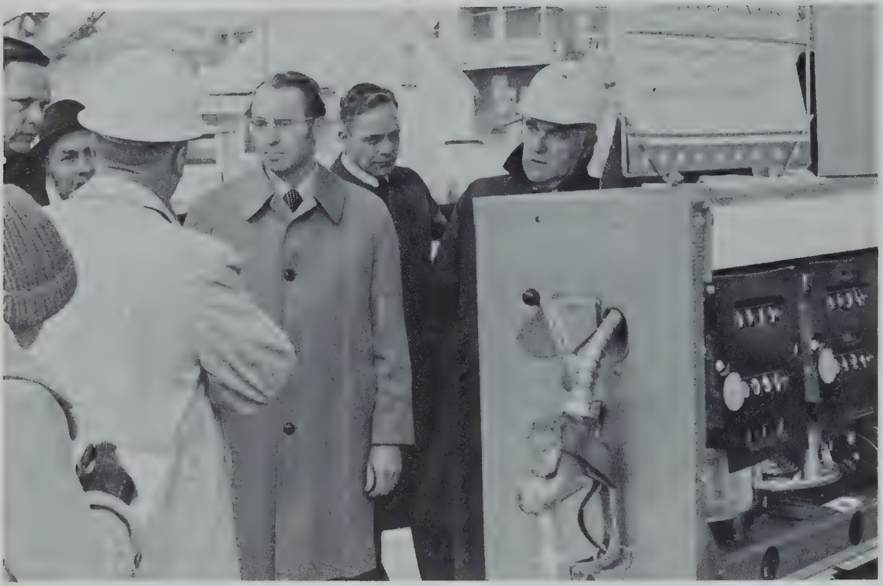
The data led to the estimate that well over a million orifice meters are in use in this country, forming a considerable subelement of the total NMS. Use of these meters impacts such national concerns as energy, environmental quality, occupational safety and health, and equity in commerce. A certain sewage treating plant was noted that is limited by regulations to an outflow of 18,000,000 gallons per day. The measurement of efflux is considered accurate to within 5 percent, or an uncertainty of 900,000 gallons per day. Taking an average of 400 gallons per day per housing unit, this uncertainty represents 2,250 extra housing units which might be handled, or an equal number which might have to be cut off, if the flow were more precisely known.

Thus this microstudy has identified the need to reduce measurement uncertainties, as well as needs for data on the performance of critical flow nozzles, new flow standards, and improved measurements of low velocities and unsteady flows.

Other microstudies are revealing equally pressing needs. The thermometry group, for example, has looked carefully into the state of temperature measurement capabilities. They found that there is a very definite trend to the use of thermistors and other sensors whose characteristics are largely unknown. As a result we are now studying their stability and response to thermal cycling. A pressing need was also revealed in medical and clinical thermometry, as a result of which NBS is now providing leadership in the development of specifications for thermometric clinical instruments.

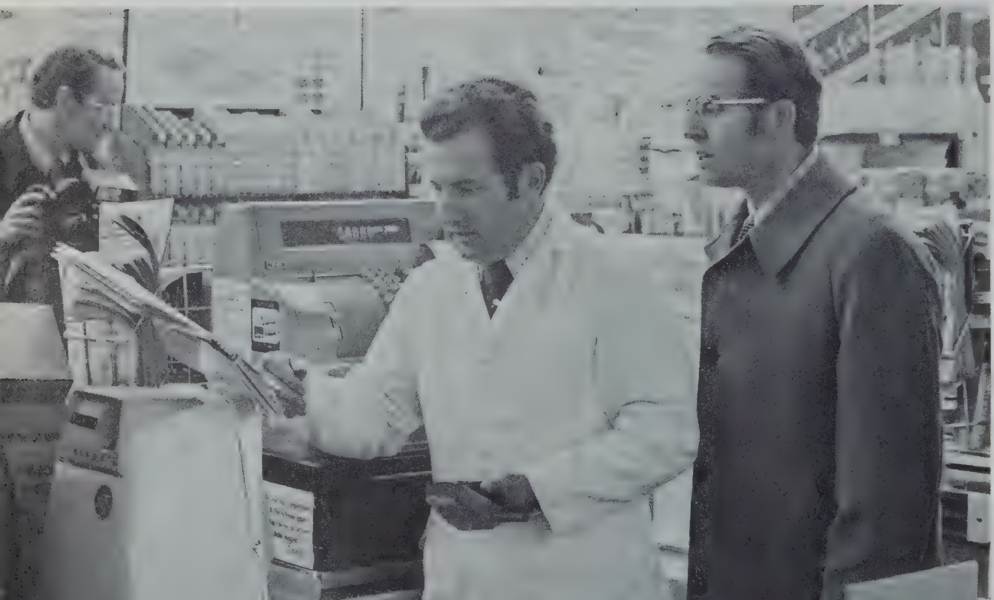
To sum up, the study is showing that the NMS is a large and important element of our technological society. Though large, it is not inert, but changes constantly in response to new measurement challenges. It is the task of measurement laboratories, including NBS, to identify those areas where the need is most urgent and to marshall their forces in those directions.

The ultimate reason for monitoring the National Measurement System, and the present study marks only another stage in a process that will be continued, is that it generates the clear perceptions needed to successfully meet this responsibility. ☐



From left, NBS Director Richard W. Roberts, Maryland Superintendent of Weights and Measures Richard Thompson and NBS Deputy Director Ernest Ambler discuss NBS gasoline pump testing procedures with a Maryland inspector.

that EQUITY may prevail



Dr. Roberts watches while a Maryland state weights and measures inspector tests the accuracy of a check-out counter scale.

THE NBS Office of Weights and Measures is not manned by gnomes who jealously hoard and guard the Nation's treasures of standard weights and measurement devices. To be sure, the Office has a store of shiny metal weights—and an array of other goods and services—but they are used to help business and industry and state and local officials ensure that quantity as advertised in the marketplace measures up to known standards.

When a buyer purchases a gallon of milk, he usually takes it on faith that he is indeed getting a gallon. State and local officials, guided by federal, state and local regulations, act not by faith but by established test methods to ensure that that gallon does not deviate more than a specified minute amount from the standard gallon. NBS can and does provide the testing procedures necessary to accurately determine that weight.

Aid to Government

A gallon of milk is one of many examples that could be cited to illustrate the role of the Bureau in this area of consumer concern. NBS Director Richard W. Roberts toured recently with Maryland state and local officials to see a few of many weights and measures activities based on NBS standards, guidelines and procedures.

Maryland inspectors are charged with such diverse monitoring responsibilities as checking the accuracy of gasoline pumps and the supermarket check-out counter weighing scale, assuring that taximeters register properly and that the one-pound can of dog food contains one pound. They depend upon procedures listed in NBS handbooks. The inspectors are law enforcement officers; they can and do bring suit against offenders who will not comply with regulations. Litigations of this sort must be based on standards and procedures that stand up in a court of law. NBS expertise is the reference point in such cases.

Aid to Manufacturers

NBS expertise is of aid not only to government officials. Manufacturers must be able to determine whether their products and methods acceptably measure up. The Office of Weights and Measures supplies those means through such activities as the Prototype Examination Program. This program provides for an evaluation of:

1. Prototype weighing and measuring devices to determine compliance with NBS Handbook 44, "Specifications, Tolerances, and Other Technical Requirements for Commercial Weighing and Measuring Devices."

2. Standards to determine compliance with the requirements of NBS Handbooks 105–1, 105–2, or 105–3, "Specifications and Tolerances for Reference Standard and Field Standard Weights and Measures." This program may be used by manufacturers and weights and measures officials in determining the acceptability of devices for commercial use or the suitability of reference and field standards. NBS will make tests on equipment at any stage of development whether that equipment is sent to the laboratory for analysis or whether the testing must be done in the factory or the field.

National Conference

The forum at which government officials, manufacturers and other business and industry representatives and consumer advocates gather to mull over weights and measures problems and projects is the yearly meeting of the National Conference of Weights and Measures, sponsored by NBS since the inception of the Conference in 1905. At this time the various groups work to reach a consensus on model legislation that states and local jurisdictions can adopt, to promote uniformity of requirements and methods and to foster cooperation among all parties.

"That Equity May Prevail" is both the goal and the motto of the Conference, and NBS' role is to interact directly with weights and measures personnel and to provide the technical assistance necessary to further efforts toward that goal. The Bureau director acts as the conference's ex officio president, and he appoints as executive secretary an experienced NBS expert on weights and measures.

A recent accomplishment of the Conference was the 1973 Model State Open Dating Regulation. This model regulation, which is recommended to the states for adoption, provides for a pull date—a specified last date—on which a perishable product should be sold "without a significant risk of spoilage, loss of value, or loss of palatability." The buyer can check for a date on perishable items such as milk to determine whether this regulation is in effect in his area.

Fair Packaging

Assistance in achieving equity comes from other quarters too. For instance, the Fair Packaging and Labeling Act passed by the United States Congress in 1966 ensures that adequate information as to size and weight is displayed on packages so that the buyer can do comparison shopping. State and local weights and measures inspectors act as market minutemen to make sure that the information is correct.

Under this law, packagers and Federal, state and local officials agree on the quantities in which packages should be offered for sale so that a confusing variety of package sizes does not hinder comparison shopping.

Consumer Questions

In spite of government and industry efforts, the buyer sometimes suspects that a gasoline pump is registering more gallons than it is giving or that a package does not contain its stated weight.

These suspicions could be correct: mechanical devices are subject to wear and tear and mistakes will be made. In these cases, the consumer can contact weights and measures personnel directly by checking the telephone directory under the city, county or state government headings. The responsible government department is often listed under "Weights and Measures" or "standards."

Inquiries may also be sent to:

National Conference on Weights
and Measures
National Bureau of Standards
Washington, D.C. 20234
Telephone: 301/921–3677

Consumers will receive a prompt reply to their questions and a list showing officials in their locales who can be contacted for further information. ☐

NBS CONTRIBUTES TO

FERRITE MEASUREMENT

IN STAINLESS STEEL
WELDS AND CASTINGS

A NEW method for determining the relative amounts of austenite and ferrite in welds and castings[1] has been devised by physicists at the National Bureau of Standards, U.S. Department of Commerce, working with representatives of the stainless steel welding and casting industries.

The nondestructive technique can be used to calibrate weld and cast stainless steel standards for ferrite content.

The presence of some ferrite in the microstructure of stainless steel has a significant effect on its physical and mechanical properties. Compared to wholly austenitic alloys, those containing some ferrite can have improved welding characteristics, increased strength, and substantially greater resistance to stress corrosion cracking. However, too much ferrite can decrease corrosion resistance.

Since stainless steel is used where strength and corrosion resistance are important, strict control of the ferrite content is essential to assure the integrity of welds, especially in critical structures for nuclear power and aerospace. Chemical plants also use many stainless steel storage and reaction vessels.

Bureau scientists investigating the applicability of the Mössbauer-effect scattering method to the problem of determining ferrite in austenite in bulk materials found that the method offers a highly accurate and self-characterizing means for determining the relative amounts of ferrite and austenite.

The Mössbauer effect is a technique for observing resonant nuclear γ-ray fluorescence in solids. Using this technique, it is possible to distinguish different phases in a material on the basis of variation in effect of the magnetic fields, the electric field gradient, or the electron charge density. Scattering spectra are obtained by detecting either the 14.4 keV γ rays, 6.3 keV x rays, or internal conversion electrons. When different phases in a metal give well-resolved Mössbauer spectra, the relative area of the spectral patterns provide an indication of the amount of each phase present.

Instead of monitoring the transmitted radiation, researchers Dr. Lydon Swartzendruber and Dr. Lawrence Bennett of NBS, collaborating with Erni A. Schoefer of the Steel Founders Society of America, William DeLong of Teledyne McKay, and Hallock C. Campbell of Arcos Corp., measured the reflected radiation. Utilizing backscattered 14 keV γ rays, they obtained Mössbauer spectra from a series of stainless steel welds and castings. Compared to conventional magnetic methods, this technique is much less influenced by size and orientation of the ferrite particles.

Results indicate that, with further refinement, Mössbauer scattering with its unique advantages should be useful in providing baseline information for the calibration of standards and instruments for field use in terms of true ferrite content. Factors needed to relate the Mössbauer spectral area ratios to the percent ferrite have been developed.

A standardized magnetic test procedure recently agreed upon by the Welding Research Council (WRC) permits reliable comparison of measurements made at different laboratories. NBS aided the WRC in replacing the old percent ferrite specifications with a ferrite number specification. This aid consisted of preparing a special package of coating-thickness Standard Reference Materials for calibrating Magne-Gages (a measuring instrument developed at NBS in the 1930's) in terms of the new ferrite number scale.

However, the relation of the assigned ferrite numbers to the true ferrite content is arbitrary to some extent and, although it represents a good average based on existing commercial practice, it can be influenced by the shape, size, and orientation of the ferrite particles. As close an agreement as possible between the ferrite number and the actual ferrite content is necessary to understand the relation between the ferrite content and the physical properties of the alloy. Further development of the Mössbauer-effect backscatter technique should provide a means for calibrating actual standards of ferrite in stainless steel. The present coating-thickness standards have the disadvantage that they can be used only to calibrate a particular type of instrument, the Magne-Gage. Secondary standards are required to calibrate other frequently used types of instrument, e.g., those based on eddy currents.

The Mössbauer-effect scattering method was used to show that the ferrite number and the percent ferrite agree closely up to about 20% ferrite. Above that, the ferrite number scale needs revision to bring it into accord with the actual ferrite content. ☐

Controlling the amount of ferrite in stainless steel is especially important in nuclear power plants where there are strict specifications for physical and mechanical properties of materials.

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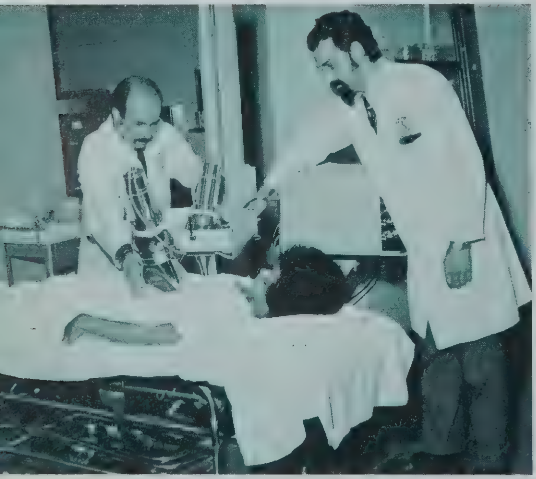
[1] Swartzendruber, L. J., Bennett, L. H., Schoefer, E. A., DeLong, W. T., and Campbell, H. C., Mössbauer—effect examination of ferrite in stainless-steel welds and castings, in press.

REDUCING THE HEALTH HAZARD

OF POOR RADIOACTIVITY MEASUREMENTS

A PHYSICIAN treating a case of hyperactive thyroid might call for 5 microcuries of the radioactive isotope iodine–131. The actual dose provided by the hospital laboratory may in fact be 12 microcuries.



Physicians in the Nuclear Medicine Department of the National Institutes of Health Clinical Center check a patient for abnormalties of the spleen and liver. They are using a scintillation counter that measures the amount of previously injected radioisotope that has collected in those organs. (Photo courtesy NIH.)

Although only hypothetical, and hardly credible, this example could very well happen, for any of a number of reasons, to judge from the very divergent results that different hospitals obtained in measuring identical samples submitted in recent surveys. Other discrepancies, ranging up to a factor of four, strongly suggest inadequate original calibration by the manufacturer or unskilled maintenance of the measurement instrumentation.

The surveys, initiated by the College of American Pathologists and aided by the National Bureau of Standards, were described in talks that were part of the seminar-workshop, Radioactivity Measurements in Nuclear Medicine, held recently at NBS. Their results explain the dissatisfaction in the medical community with the quality of its radioactivity measurements.

They also explain why, over the past few years, an ever increasing number of requests for assistance from various institutions, individuals and instrument manufacturers involved in medically oriented radioactivity measurements have been received by the NBS Radioactivity Section.

From discussions with individuals and groups concerned, the conclusion was inescapable that a forum for disseminating expertise in measurement to the nuclear medicine community was sorely needed. The Radioactivity Section accordingly requested, and obtained, permission to organize the seminar-workshop which was conducted by experts from both within and outside of NBS.

Announcement of the seminar elicited more than twice the number of requests for registration than could be accommodated. A second session to handle the overflow was planned for early this year.

Highlights of the Seminar

The first morning session got down at once to a survey of nuclear medicine instrumentation by Dr. Michael J. Welch of the Edward Mallinkrodt Institute of Radiology. Then Dr. Wilfrid B. Mann set forth the work of the Radioactivity Section, of which he is chief, describing the nature of the radioactivity standards and basic radioactivity measurements and how they are related to the needs of nuclear medicine.

As dose calibrators are rapidly becoming the instrument of choice in medical institutions for radioactivity measurements, they were particularly emphasized by Dr. Robert L. Ayres. He presented the results of an evaluation of a variety of commercially available dose calibrators which revealed a significant number of serious errors in the calibration of these instruments.

Staff members of the Radioactivity Section, in the afternoon workshop, demonstrated the use of dose cali-

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Burglars Beware!

"THREAT ANALYSIS" LEADS TO HOMEOWNER SECURITY

FAR too many homeowners have discovered, to their dismay and loss, that the home they consider a castle is no fortress against crime.

Some 63 percent of all burglaries committed are residential in nature. Nearly two-thirds of the $723 million lost to burglars in 1972 involved thefts from dwellings. With these statistics in mind, the Law Enforcement Assistance Administration (LEAA) of the Department of Justice asked the Commerce Department's National Bureau of Standards (NBS) to undertake a research program. Its aim is the development of reports, guidelines and performance standards which, for the first time, will provide means for judging the vulnerability of exterior doors to breaking and entering.

The effort is part of an extensive program conducted by the NBS Law Enforcement Standards Laboratory (LESL), headed by Jacob J. Diamond. LESL develops national voluntary standards in such areas as law enforcement communications equipment, investigative aids, security systems, etc.

LEAA's National Institute of Law Enforcement and Criminal Justice (NILECJ) is expected to promulgate, later this year, a voluntary performance standard on door security, the first in a series of documents on door and window security now being developed. The standard will afford homeowners, tenants, homebuilders and material and hardware manufacturers with an objective means of determining the security of door installation.

"Threat Analysis"

Program manager for LESL's security systems projects is Lawrence K. Eliason. The LESL research team is headed by John Stroik, an architect, and Tom Reichard, a physicist. The door security project began with the development of what is termed a "threat analysis." This study revealed two major classifications of entry—unskilled and semi-skilled. Each of these classifications was, in turn, divided into high and low levels of "attack."

In the process, the NBS researchers came to an interesting, and disturbing, conclusion: The vast majority of homes built since World War II, with wooden doors and frames, can easily be entered by an intruder using nothing more elaborate than a few swift kicks or a screwdriver carried in a hip pocket. It is estimated that at least half, and possibly 65 percent, of all burglaries are committed by these unskilled burglars. For the most part, these intruders are young and inexperienced, frequently acting on impulse simply because of the challenge or because the opportunity presents itself.

Attack Methods

In addition to kicking and jimmying doors to gain entry, the researchers identified 12 other major methods

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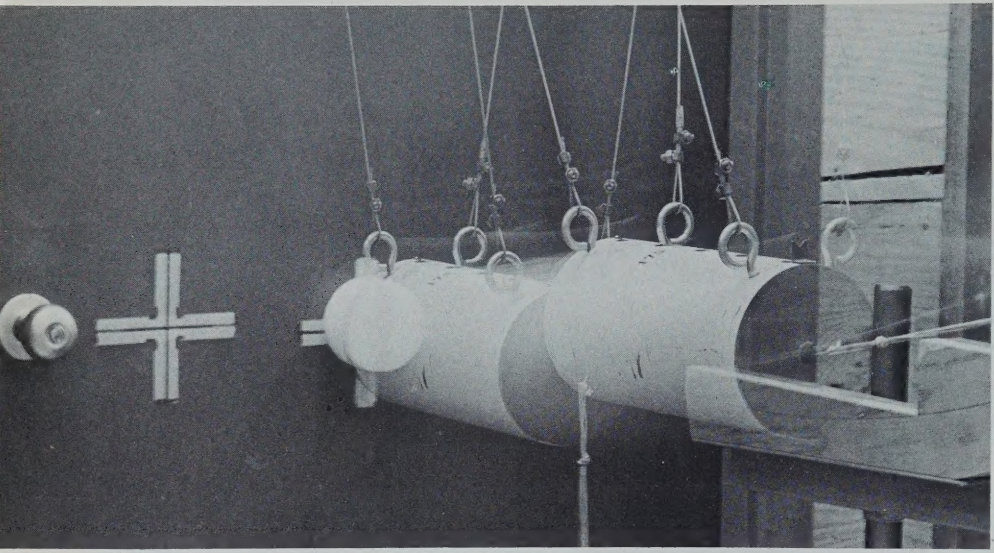

One procedure in the interim performance standards being developed for exterior doors involves the use of a weighted pendulum which applies precisely graduated levels of force against a test door assembly.

BURGLARS *continued*

of attack. These include "loiding" (inserting a thin, flat object such as a credit card between the door and the jam to release the spring bolt), popping out the lock cylinder and smashing the door knob. More sophisticated burglars, the semi-skilled, employ such techniques as spreading the door frame with a car jack, using a monkey wrench to twist apart a door knob or lock and picking the lock without damaging the mechanism.

A number of highly detailed tests were devised to determine whether a door and the surrounding frame and wall assembly could withstand such attacks. The ramming test, for example, involves the use of a 45-kilogram (99-pound) cylinder swung in pendulum fashion against the door or hardware with precisely graduated levels of force. The jimmying test employs a double-acting hydraulic ram connected directly to a load cell and inserted horizontally within the frame at lock level. As presently drafted, the standard specifies that minimum-strength doors should resist an impact of two blows at 80 joules (59 foot-pounds) and a spreading, or jimmying, force of 6,670 newtons (1,500 pounds).

Industry Review

In all cases, following completion of a draft standard, the draft is sent out for "industry review" to manufacturers, government agencies, trade associations, building code officials and other interested parties. Independent standards organizations, such as the American National Standards Institute (ANSI) and the American Society for Testing and Materials (ASTM), also receive copies of the draft. After comments on the draft have been received and appropriate responses and reviews made, the document will be submitted for promulgation as an official NILECJ standard.

An essential condition of such a standard is that it be helpful in establishing accurate comparisons for evaluation. Because the requirements are performance-oriented, manufacturers will be encouraged to exercise a maximum of innovation in meeting the standards. □

HEALTH *continued*

brators for relative radioactivity measurements, direct determination of radioactivity by single-crystal sum-peak coincidence counting and radionuclidic purity determinations by gamma-ray spectrometry.

Leading off the second day was an account of radioactivity measurements in hospitals by Professor C. Craig Harris of Duke University. Professor Harris described current practices, some of the problems inherent in these practices and some of the ways in which the practices might be improved. Lucy M. Cavallo of the Radioactivity Section then presented the results of the College of American Pathologists-NBS surveys that dramatically emphasized the need for education in the use of radioactivity standards and expertise in measurements in the nuclear medicine field.

The seminar concluded with a panel discussion on the requirements and trends in medical radioactivity measurements. Panel members, each of whom gave a 5-minute introductory talk, were: Dr. Mann, chairman, Professor Harris, Dr. Gerald J. Hine (Veterans Administration), Professor H. N. Wagner, Jr. (The Johns Hopkins Medical Institutions), Rau W. Dielman (Dielman Consultants, Inc.) and Dr. John R. Hansell (Veterans Administration Hospital, Philadelphia). Reflecting the favorable response of the participants, Dr. Wagner declared himself "ecstatic" that the Bureau was becoming actively interested and involved in this field of measurement.

The discussion that followed the panel talks produced lively exchanges on regulatory problems with respect to the procurement of radioactivity standards by medical institutions, voluntary quality assurance programs, the lag in measurement skills and facilities resulting from the rapid growth of nuclear medicine, and the role of NBS in the nuclear measurement system. □

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